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_____

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Analyzing the Assault and Sustainment Throughput Capabilities of the Maritime Prepositioning Force (Future) Squadron of Ships

Adam Martin
Operations Research Analyst
Marine Corps Combat Development Command
Operations Analysis Division
Mission Area Analysis Branch
Quantico, VA

Agenda

- ✓ **Background**
- **Overall Assumptions**
- **Surface Assault**
- **Vertical Assault**
- **Ship-to-Objective Sustainment**
- **The "Take Aways"**

Purpose

- **Purpose of study**
  - **MPF(F) Squadron Capabilities Development Document (CDD) lists:**
    - **Key Performance Parameters for MPF(F) at squadron level, including:**
      - **Air connector interfaces**
      - **Surface connector interfaces**
    - **Threshold capabilities, including:**
      - **Employ one surface and one vertical BLT in 8-10 hours**
      - **Sustain the MEB forces ashore from the sea base**
  - **Provide insights to MPF(F) CDD working group and N85**
    - **Surface assault**
    - **Vertical assault**
    - **Vertical ship-to-objective sustainment**

Can the squadron meet the threshold capabilities?

- **Purpose of this brief**
  - **Highlight the results of the study**

Study Scope

- **Focus on issues**
  - **Timelines**
  - **Surface interface points**
  - **Surface assault connectors**
  - **Assault support aircraft**
  - **Operational deck spots**
  - **Ship-to-objective sustainment**
- **Primary Measures of Effectiveness**
  - **Time to complete assaults and sustainment**
  - **Operating hours**

MPF(F) Squadron Composition

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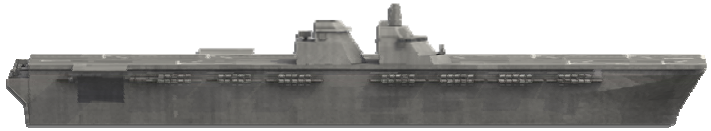
Squadron composition approved by SECNAV on 24 May 05

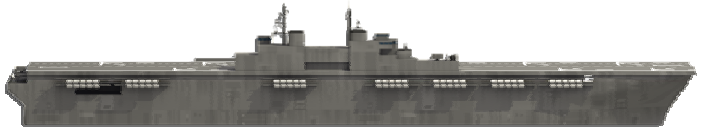
MPF(F) LHA(R) x 2



T-AKR x 3

Artist Rendition/Notional Configuration

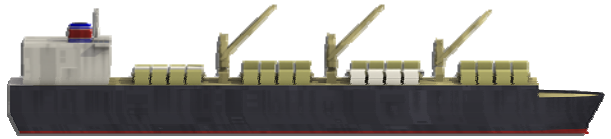
MPF(F) LHD x 1



Artist Rendition/Notional Configuration

T-AKE x 3

Legacy x 2



Artist Rendition/Notional Configuration
FLO/FLO Technology focused

MLP* x 3

Agenda

- **Background**
- ✓ **Surface Assault**
- **Vertical Assault**
- **Ship-to-Objective Sustainment**
- **The "Take Aways"**

Forces Going Ashore - Surface

- **Units**
  - 1 – Infantry Battalion
  - 1 – Tank Company
  - 1 – LAR Company
  - 1 – LW155 Battery
  - 1 – Combat Engineer Spt Det
  - 1 – DS CSS Company
  - 1 – LAAD Detachment
- **Personnel/Representative Equipment**

Item	Number	+ additional
PAX	1,726	183
Tanks	14	
HMMWV Wpn Carrier	32	3
HMMWV Cargo/Comm	94	25
LW155	6	
MTVR	33	15
LAV	28	
LVSR	7	12

53 LCAC SLEP loads
+ 18 more

Surface Assault Assumptions

- 25 NM ship-to-shore
- Surface BLT moved to 3 MLP prior to the assault
- Surface BLT launched from 3 MLP
- 18 LCAC SLEP pre-loaded on 3 MLP
- 3 LCAC SLEP in MPF(F) LHD well have pre-boated Mech Co in reserve (not used for assault)
- LCAC SLEP A_O: 95% (rounded down)*
- LCAC SLEP speeds of 35 Kts for both ingress and egress
- Significant wave height 3.0 ft (NATO SS 3)
- LCAC SLEP processing time of 67 minutes on MLP**
  - Processing time: Time from entering MLP to exiting MLP
- LCAC SLEP unload time of 15 minutes on beach***

* Approved by N753L on 14Sep05, applies to surge rate for the first day of the surface assault and does not include combat attrition

** LCAC Cargo Loading Operations Onboard Amphibious Well Deck Ships, NAVSEA Panama City, 2002

*** LCAC Data Summary and Analysis, CNA, 1992

Surface Assault Excursions

Mission Area Analysis Branch—Analyzing the Future

- **Land DS CSS Co and LAAD Det**
- **Notional LCAC(X) (N7 NCDP Study, 2005)**
  - **Payload weight: 279,860 lbs**
  - **Payload square: 2,611 SqFt**
  - **12 LCAC(X) pre-loaded on 3 MLP**
  - **2 LCAC(X) in MPF(F) LHD well have pre-boated Mech Co in reserve (not used for assault)**
- **Improved processing times***
  - **LCAC SLEP: From 67 min to 49 min**
  - **LCAC(X): From 92 min to 65 min**
- **Vary number of operational connectors**

* Well Deck Throughput Study, NAVSEA Panama City, 2003

Processing Times Comparison

	LCAC SLEP	LCAC(X)
Current Procedures	67 min	92 min
Improved Procedures	49 min	65 min

Current procedures*

- NAVSEA Study 2002
- Identified discrete event steps associated with LCAC SLEP cargo loading ops

Improved procedures*

- NAVSEA Study 2003
- Dedicated team loading
- Concurrent passenger loading and Foreign Object Damage walk-down
- Load planning software

* LCAC(X) times extrapolated from LCAC data

LCAC SLEP Results- BLT w/out DS CSS & LAAD

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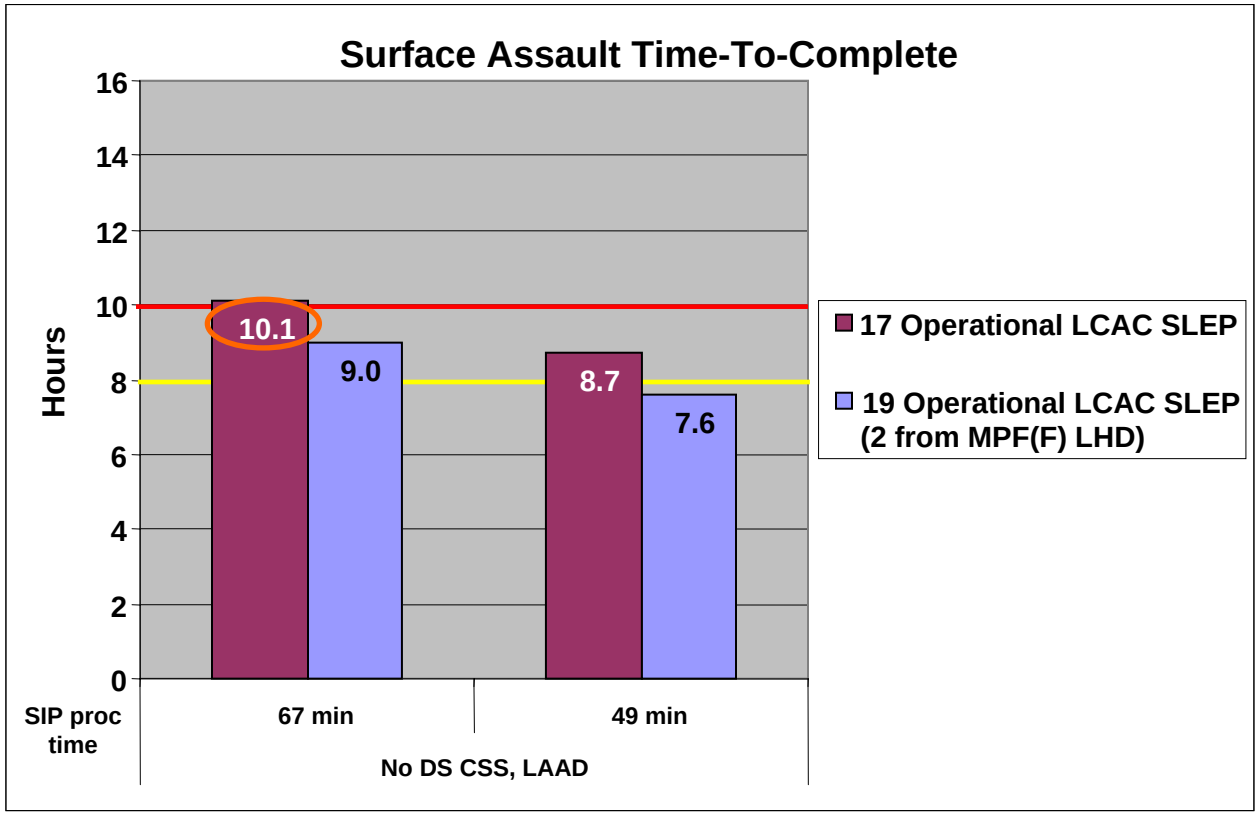


Can meet 10-hour threshold for landing surface BLT (w/out DS CSS and LAAD) with:

- **Improved SIP processing time**

-OR-

- **Use of LCAC SLEP from MPF(F) LHD**

Can meet 8-hour objective for landing surface BLT (w/out DS CSS and LAAD) with:

- **Improved SIP processing time**

-AND-

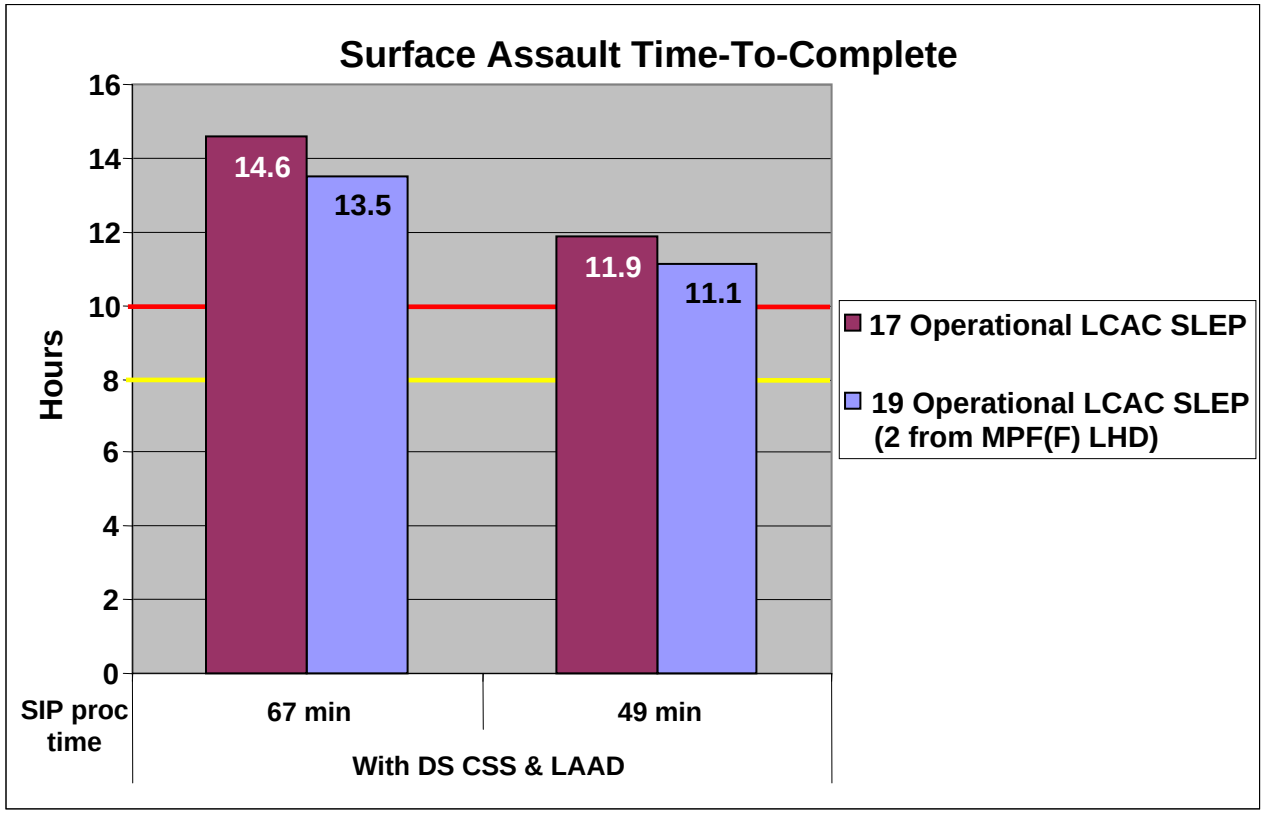
- **Use of LCAC SLEP from MPF(F) LHD**

Base Case-

18 LCAC SLEP (17 Operational), No DS CSS and LAAD, 67 min SIP proc time

LCAC SLEP Results- BLT w/ DS CSS & LAAD

Mission Area Analysis Branch—Analyzing the Future

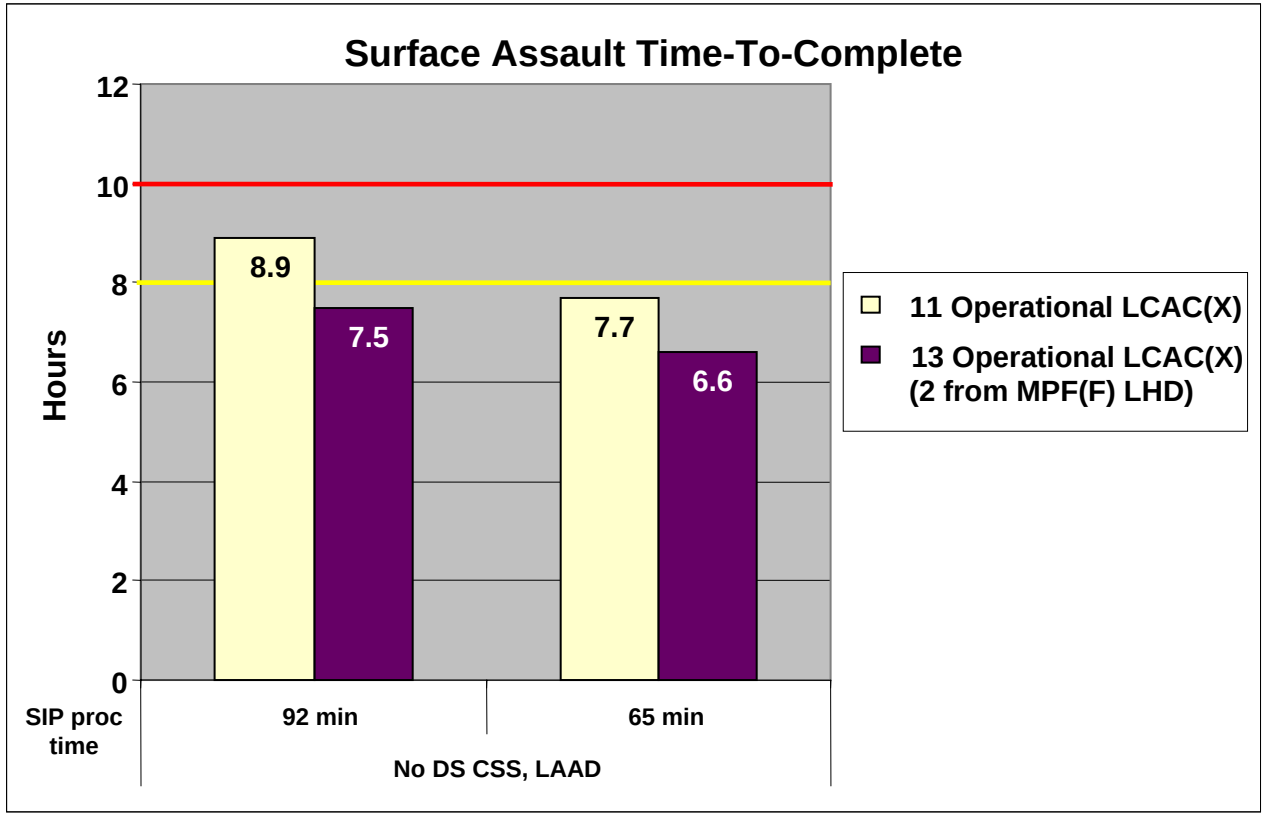


Cannot meet 10-hour threshold when landing BLT, DS CSS, and LAAD using LCAC SLEP

Best case is 11.1 hours, using LCAC SLEP from MPF(F) LHD and improved SIP processing time

LCAC(X) Results- BLT w/out DS CSS & LAAD

Mission Area Analysis Branch—Analyzing the Future



Can meet 8-hour objective for landing surface BLT (w/out DS CSS and LAAD) with LCAC(X) and

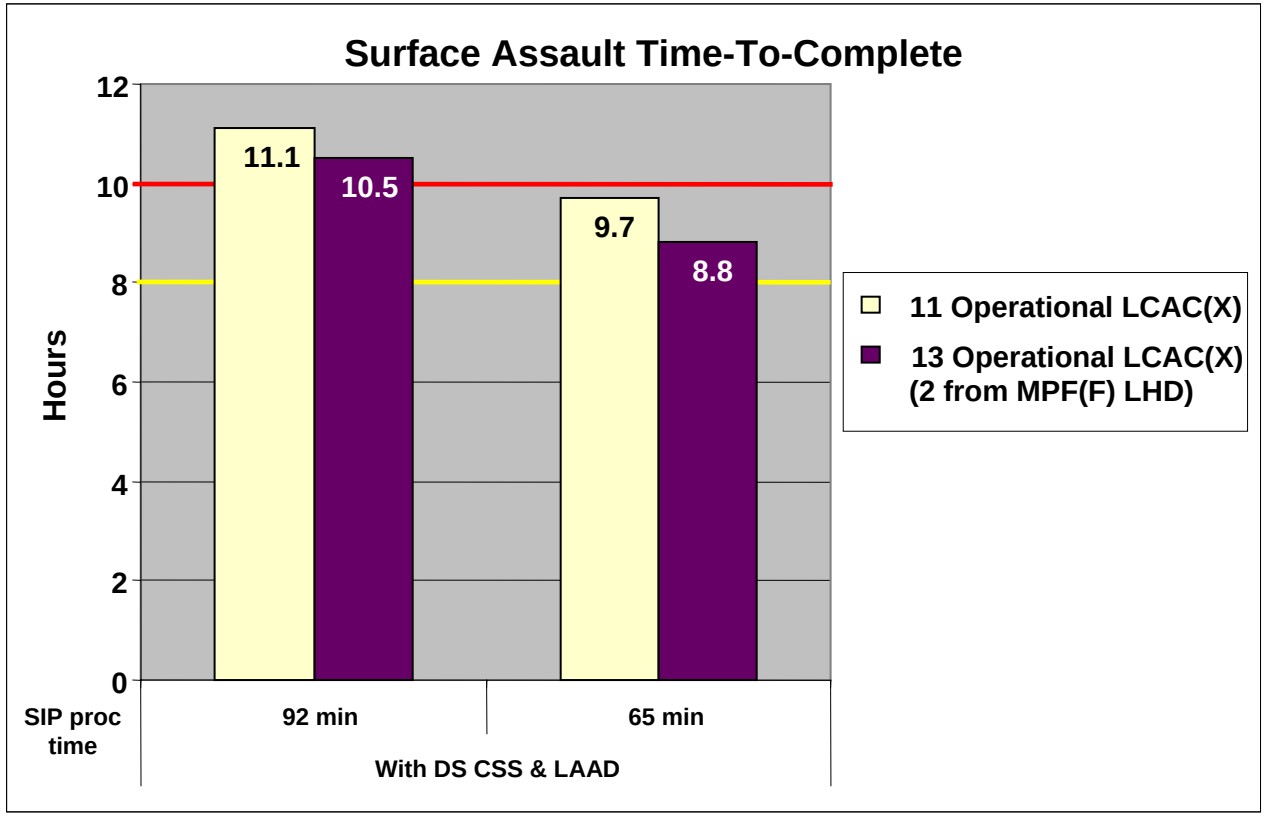
- **Improved SIP processing time**

-OR-

- **Use of LCAC(X)s from MPF(F) LHD**

LCAC(X) Results- BLT w/ DS CSS & LAAD

Mission Area Analysis Branch—Analyzing the Future



Can meet 10-hour threshold for landing surface BLT, DS CSS, and LAAD with LCAC(X) and

- **Improved SIP processing time (without use of LCAC(X) from MPF(F) LHD)**

Best case is 8.8 hours, using LCAC(X)s from MPF(F) LHD and improved SIP processing time

LCAC(X) Results- Average Operating Hours

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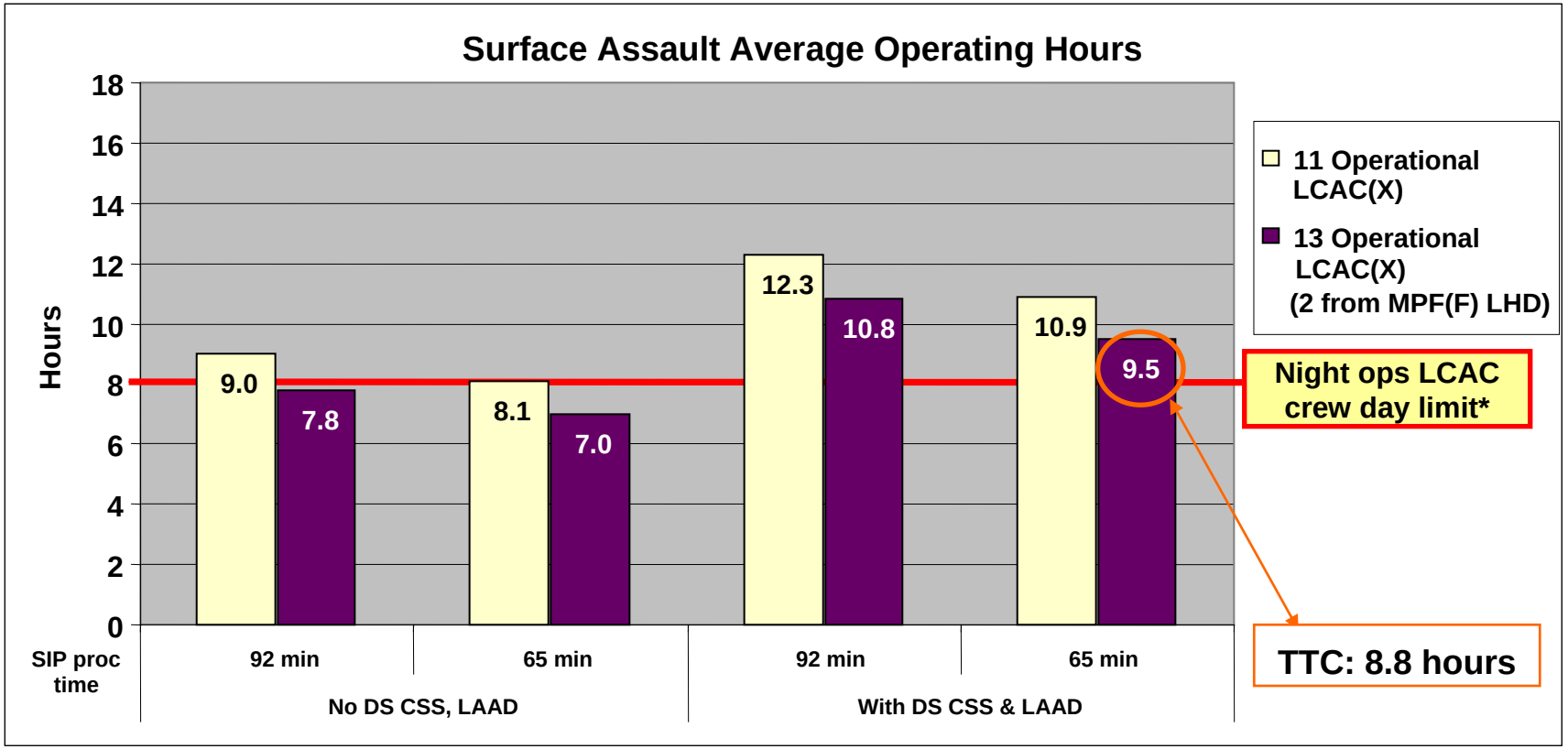


If LCAC(X) night ops crew day is increased to 10 hours, then the average crew day would be under the limit*

*Given 13 operational LCAC(X) and SIP processing time of 65 minutes

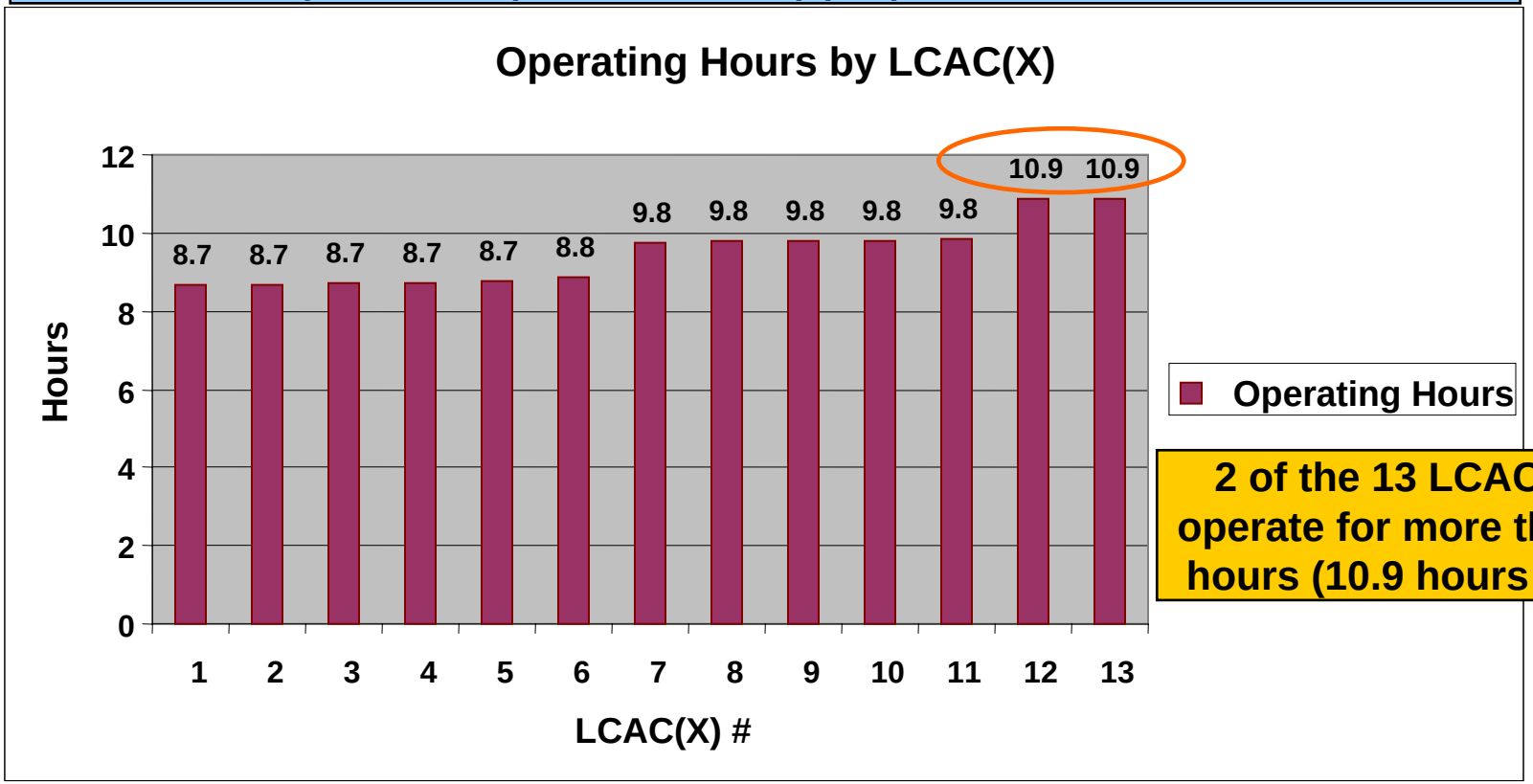
Surface Assault Operating Hours by LCAC(X)

Mission Area Analysis Branch—Analyzing the Future

Time-To-Complete: 8.8 hours*

Average Operating Hours: 9.5 hours*

How many of the 13 operational LCAC(X)s operate for more than 10 hours?

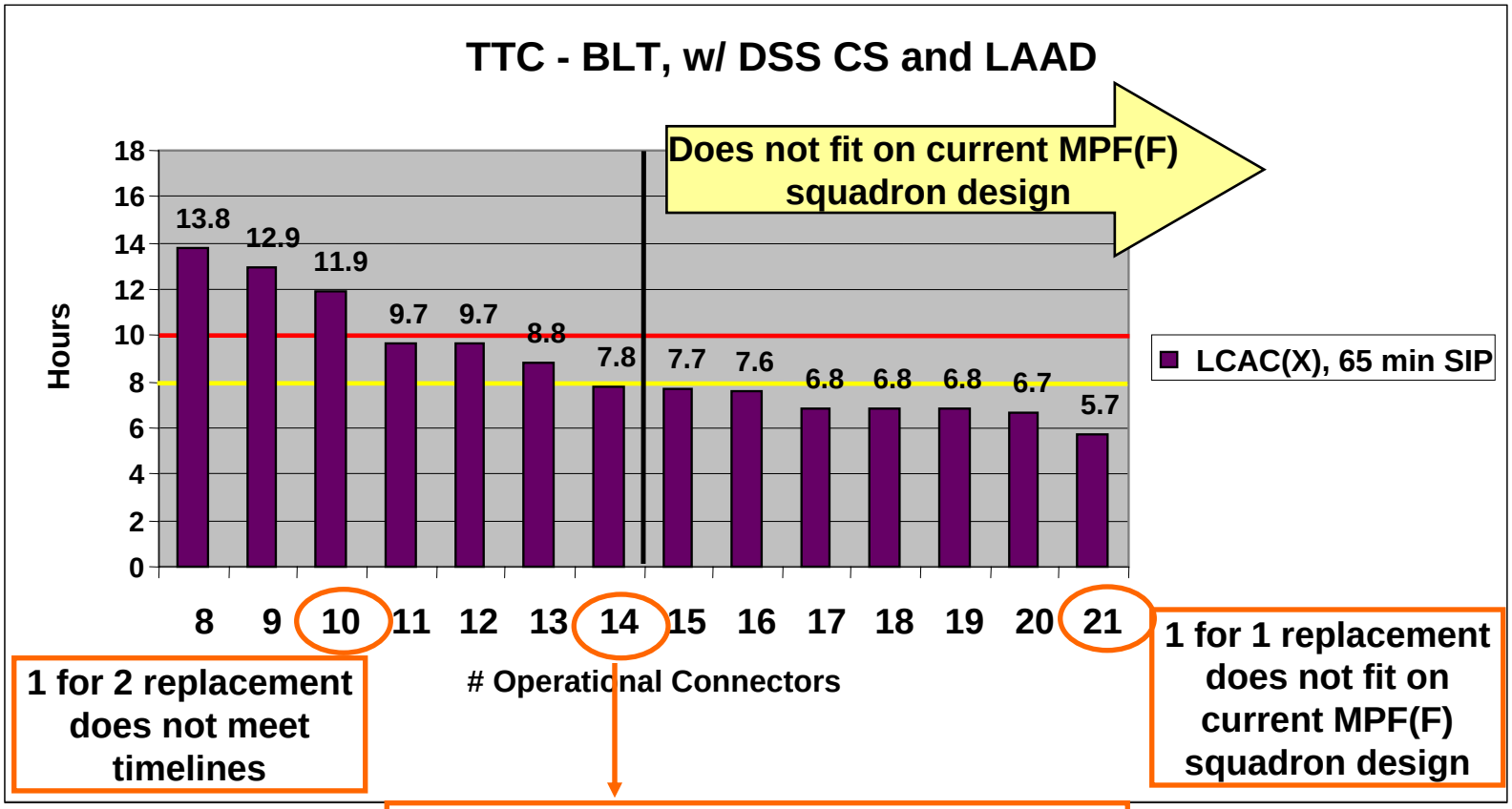


2 of the 13 LCAC(X)s operate for more than 10 hours (10.9 hours each)

*Given surface BLT with DS CSS and LAAD, 13 operational LCAC(X) and SIP processing time of 65 minutes

Sensitivity Analysis- # Operational Connectors

Mission Area Analysis Branch—Analyzing the Future



Surface Assault "Take Aways"

- **Surface Assault w/ LCAC SLEP**
  - **<u>Can</u> meet 8-hour objective for landing surface BLT (w/out DS CSS and LAAD) with**
    - **Improved Surface Interface Point (SIP) processing time**

      -AND-
    - **Use of LCACs from MPF(F) LHD**
  - **<u>Cannot</u> meet 10-hour threshold for landing surface BLT, DS CSS, and LAAD**
- **Surface Assault w/ Notional LCAC(X)**
  - **<u>Can</u> meet 10-hour threshold for landing surface BLT, DS CSS, and LAAD with**
    - **Improved SIP processing time**

Agenda

- **Background**
- **Surface Assault**
- ✓ **Vertical Assault**
- **Ship-to-Objective Sustainment**
- **The "Take Aways"**

Forces Going Ashore - Vertical

- **Units**
  - 1 – Infantry Battalion
  - 1 – EFSS Battery
  - 2 – Combat Engineer Platoons
  - 1 – DS CSS Company
  - 1 – LAAD Det
- **Personnel/Representative Equipment**

Item	Number	+ additional
PAX	1,115	104
HMMWV Wpn Carrier	22	2
HMMWV Cargo/Comm	67	31
EFSS	6	
ITV	8	

156 MV-22-equivalent loads
+ 49 more

Vertical Assault Assumptions

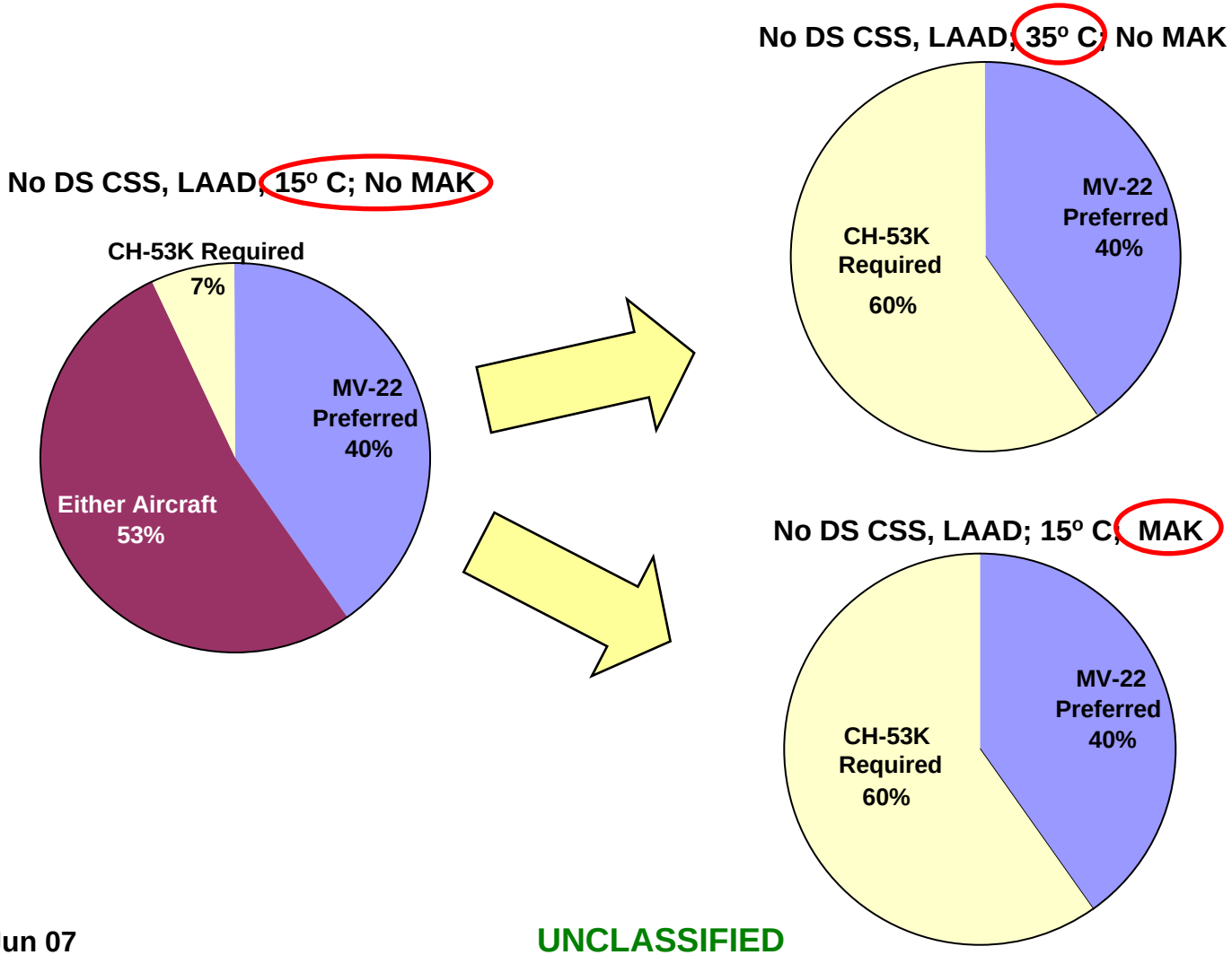
- 110 NM ship-to-objective
- Vertical BLT launched from 2 MPF(F) LHA(R) and 1 MPF(F) LHD
- 124 KIAS for external load speed*
- 15^{o} C, no wind, LZs at sea level
- Assault support aircraft from MEB ACE in MPF(F) squadron
  - 48 MV-22
  - 20 CH-53K
- Aircraft availability
  - CH-53K MCR: 80% (WG Guidance- DC AVN)
  - MV-22 MCR: 82% (ORD Threshold)
  - 14% (5) MV-22s held out for CASEVAC and other missions (III MEF Planning Factors)
- Without aerial refueling
- No additional armor on vehicles
- 6 Operating Spots per MPF(F) LHA(R) and MPF(F) LHD

* 124 KIAS is the weighted average of speeds specified in FM10-450 for loads carried in the assault

Vertical Assault Excursions

- **Land DS CSS and LAAD Det**
- **Vary temperature from 15º C to 35º C**
- **Add MAK to HMMWVs**
- **Vary number of operational deck spots per MPF(F) LHD/MPF(F) LHA(R)**

Impact of Temperature / Armor



Vertical STOM Results

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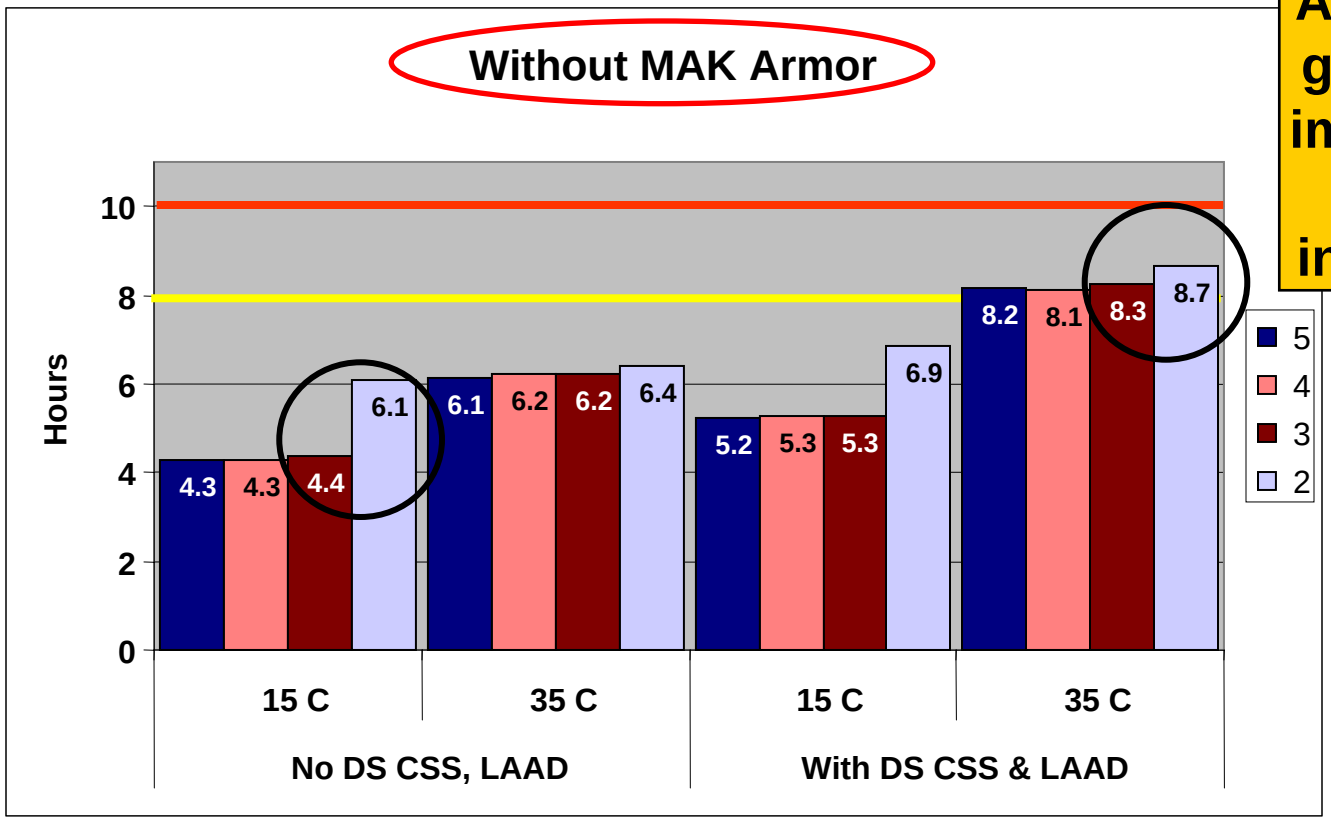
At 15° C, greatest impact is 38% increase

At 35° C, greatest impact is 5% increase



All cases still near or below 8-hour objective

Vertical STOM Results

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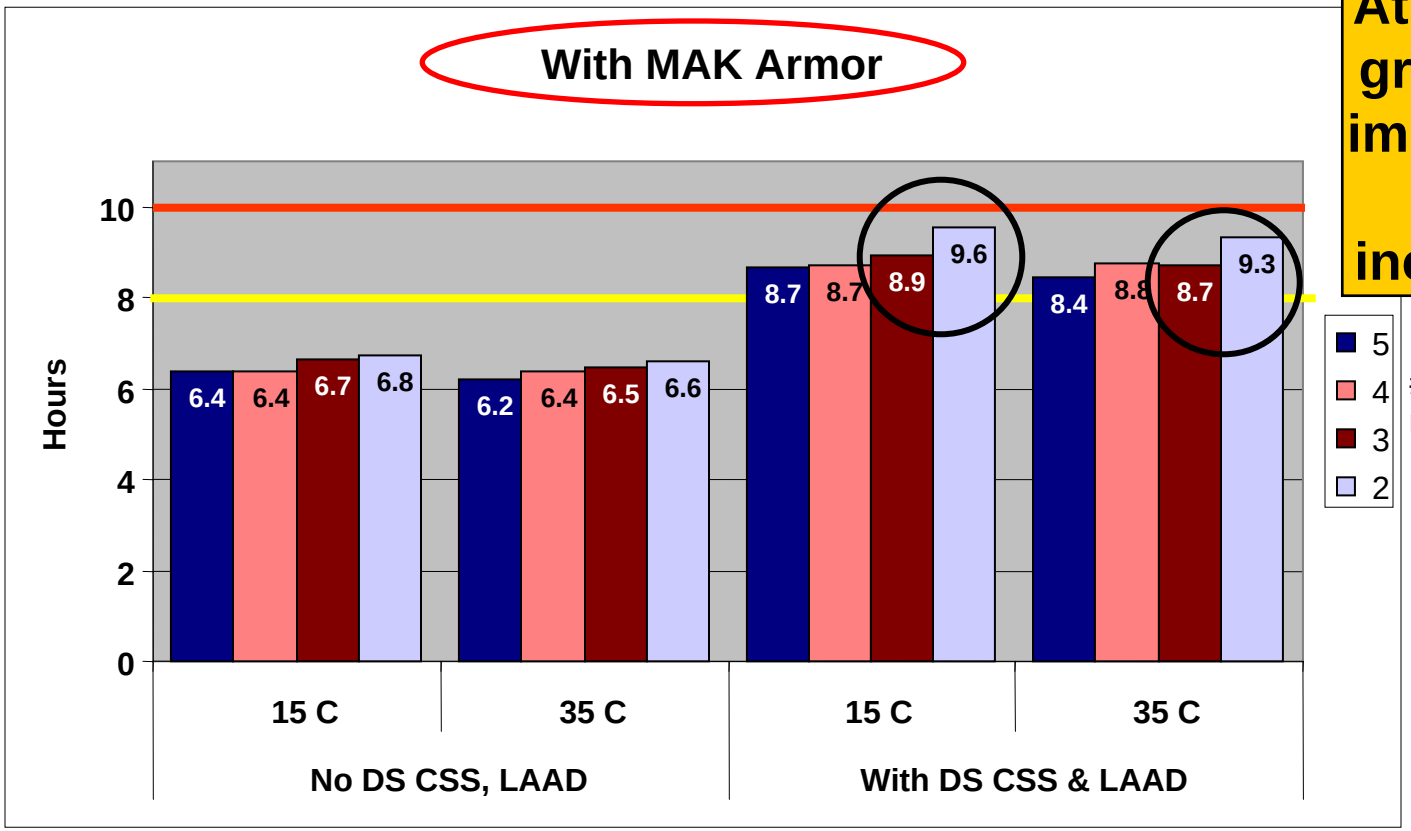
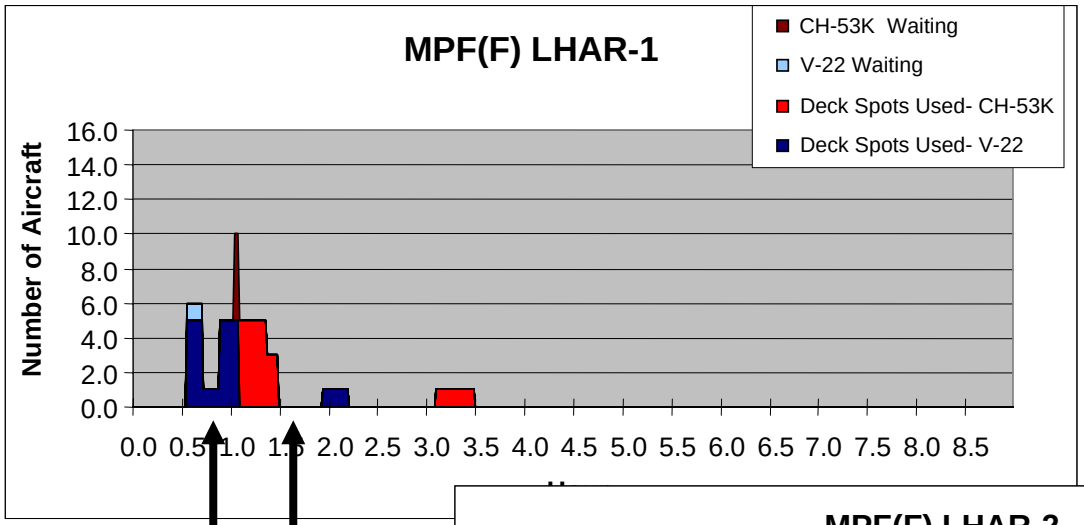
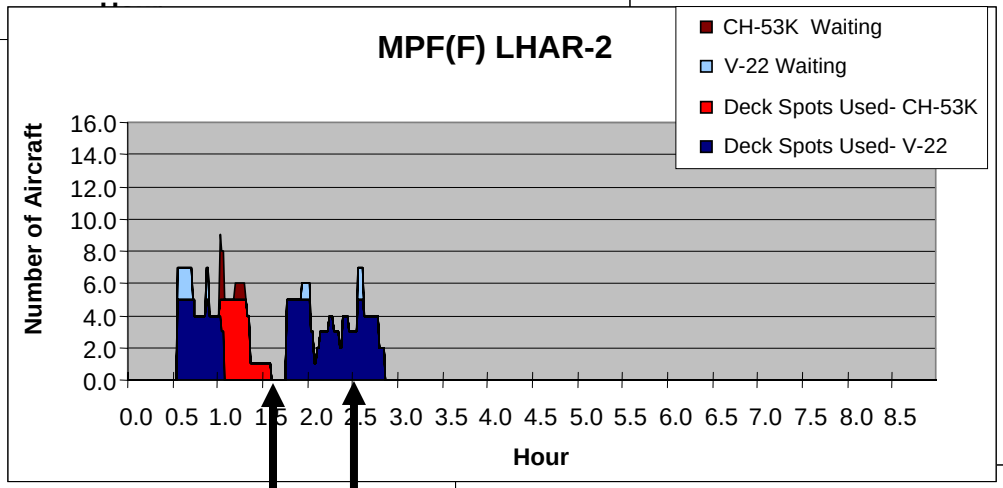
At 15° C, greatest impact is 8% increase

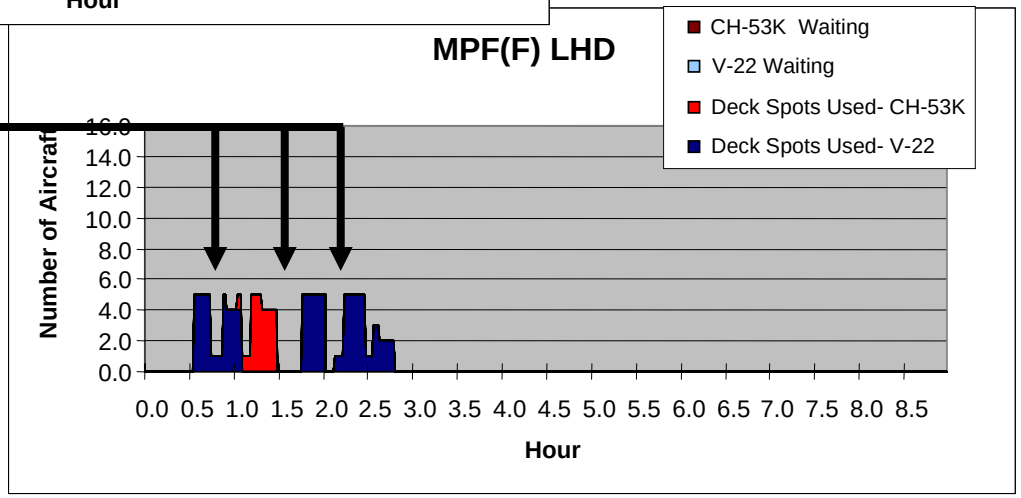
At 35° C, greatest impact is 7% increase



All cases still below 10-hour threshold





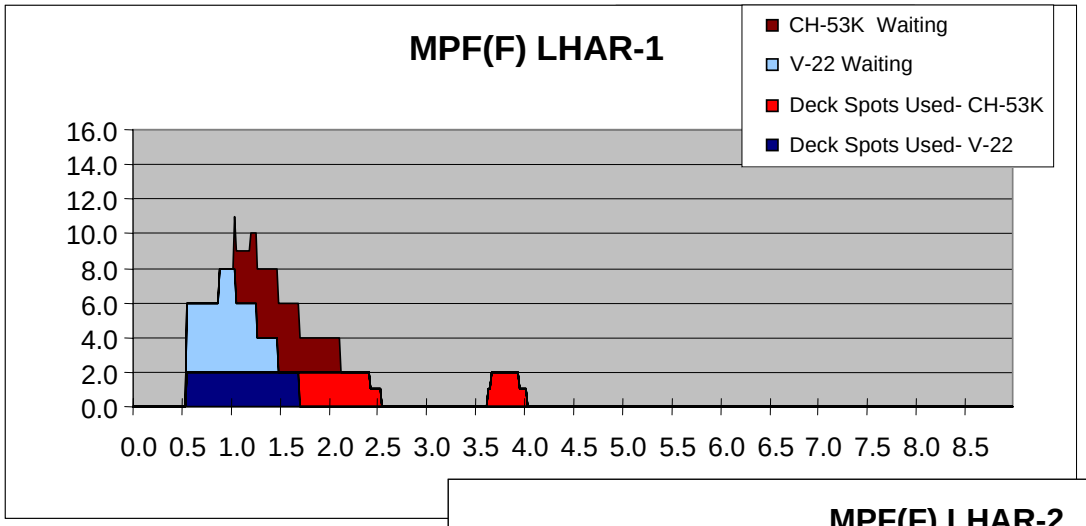


5 refueling/internal spots

No DS CSS, LAAD

No MAK, 15º C

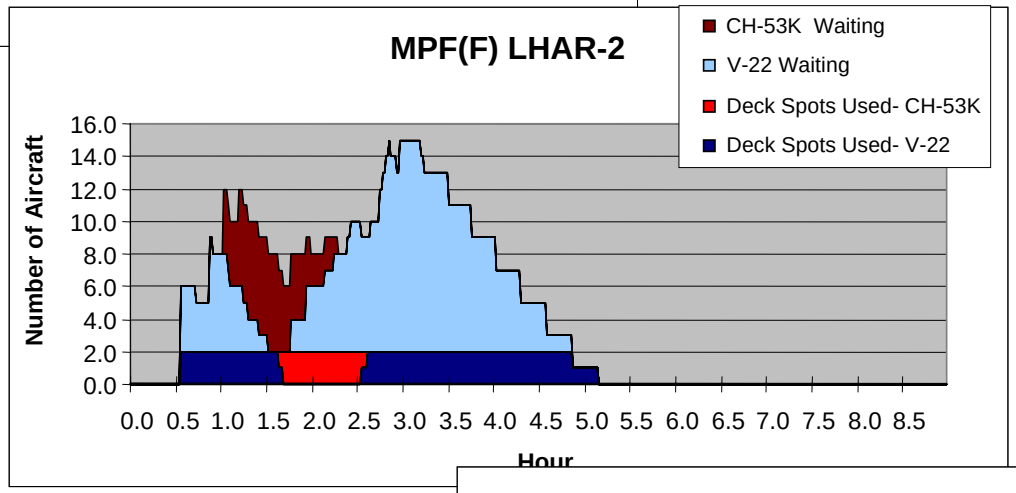
There are gaps in the activity on the ships



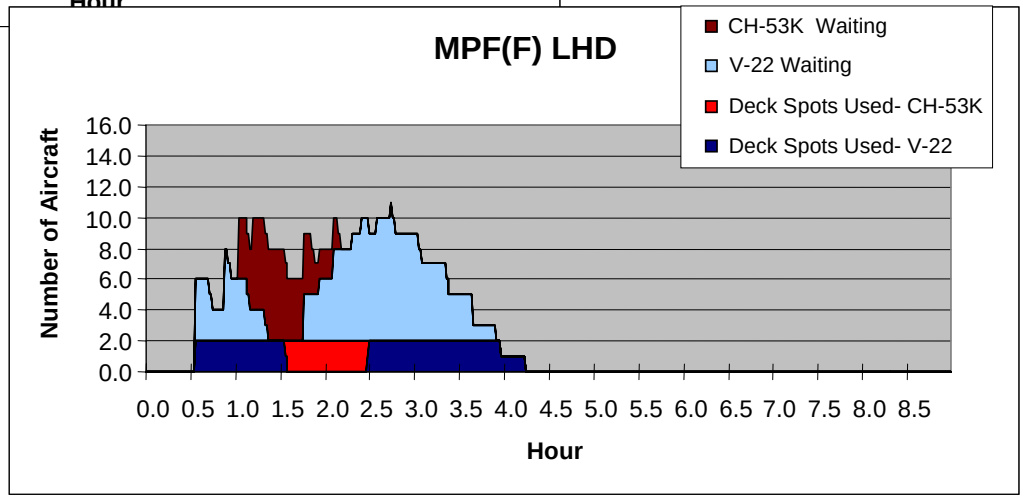
2 refueling/internal spots

No DS CSS, LAAD

No MAK, 15° C



As the number of operational spots decreases, the gaps can no longer absorb aircraft and the time must shift to the right



Vertical Assault "Take Aways"

- **Vertical Assault**
  - **<u>Can</u> meet 8-hour objective for landing vertical BLT (w/out DS CSS and LAAD)**
    - **With Marine Armor Kit (MAK) armored HMMWV at 35º C**
  - **<u>Can</u> meet 8-hour objective for landing vertical BLT, DS CSS and LAAD**
    - **Without MAK armored HMMWV at 15º C**
  - **<u>Can</u> meet 10-hour threshold for landing vertical BLT, DS CSS and LAAD**
    - **With MAK armored HMMWV at 35º C**

Agenda

- Background
- Surface Assault
- Vertical Assault
- ✓ Ship-to-Objective Sustainment
- The "Take Aways"

Ship-to-Objective Sustainment Assumptions

- **Entire Sea Based Maneuver Element (SBME) ashore (3 BLTs, Arty Bn, RLT HQ, DS CSS Bn, etc.)**
- **Forces go ashore with prescribed load for initial assault**
  - **BA + 1 DOA (assault rate) for ammo**
  - **1 DOS for all other supplies**
- **Sustainment planning factors**
  - **Infantry-heavy threat**
  - **Assault rate of consumption**
- **All units positioned 110 NM from Sea Base**
- **Ships providing SBME sustainment vary by class of supply**
  - **2 LMSR: Water**
  - **2 MPF(F) LHA(R)/MPF(F) LHD: Fuel**
  - **2 T-AKE: Dry goods and ammo**

Ship-to-Objective Sustainment Assumptions (cont'd)

- **Aviation ship operations are staggered in order to provide continuous 24-hr availability of assault support aircraft and flight decks**
- **1-2 aviation ships operating during vertical ship-to-objective sustainment window**
  - **Flight windows are 12 hours**
    - **10 hours available for actual flying**
    - **2 hours for spotting/re-spotting**
- **Aircraft availability**
  - **CH-53K MCR: 80% (WG Guidance- DC AVN)**
  - **MV-22 MCR: 82% (ORD Threshold)**
  - **4 MV-22s held out for CASEVAC and other missions**
- **Assume 2 options for assault support lift coverage**

Assault Support Lift Coverage- Option 1

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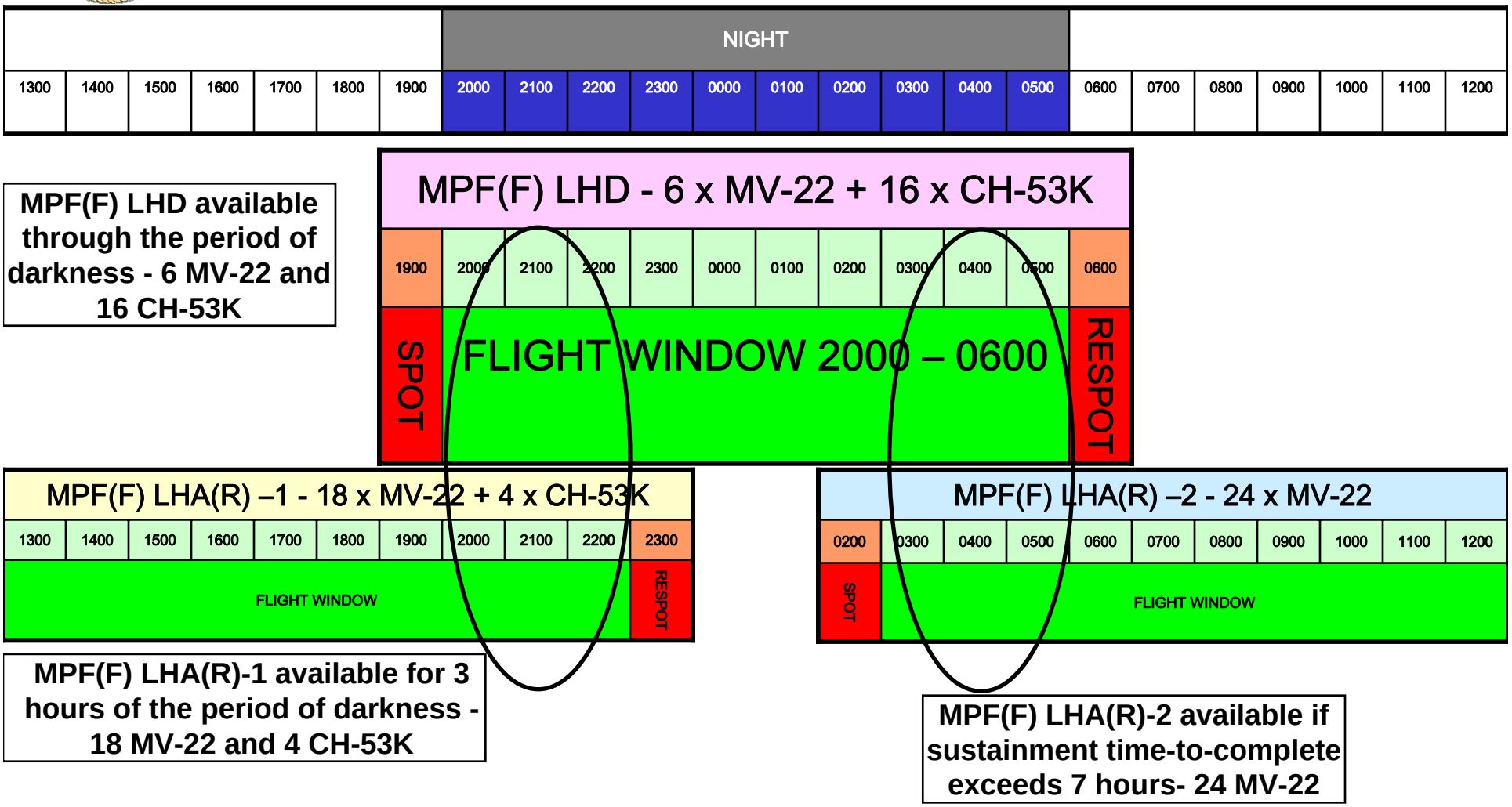

Assault Support Lift Coverage- Option 1

Best and Worst Case

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Start re-supply
Best Case

Start re-supply
Worst Case

							NIGHT																
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200

MPF(F) LHD - 6 x MV-22 + 16 x CH-53K

1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600
SPOT	FLIGHT WINDOW 2000 – 0600										RESPOT

MPF(F) LHA(R) –1 - 18 x MV-22 + 4 x CH-53K

1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
FLIGHT WINDOW										RESPOT

MPF(F) LHA(R) –2 - 24 x MV-22

0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
SPOT	FLIGHT WINDOW									

AIRCRAFT AVAILABLE FOR SUSTAINMENT PER HOUR MV-22																							
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
18	18	18	18	18	18	18	24	24	24	6	6	6	6	30	30	30	24	24	24	24	24	24	24

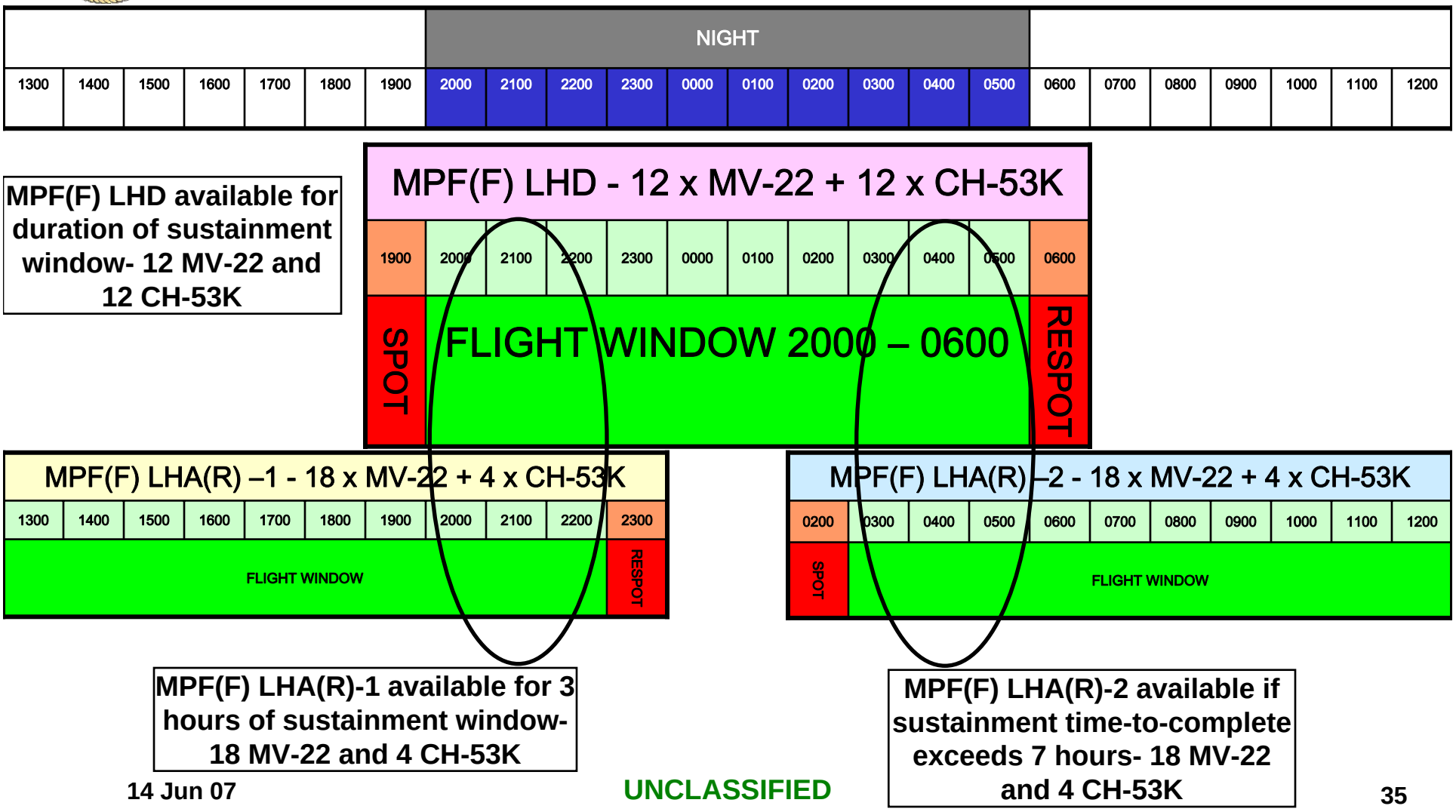
AIRCRAFT AVAILABLE FOR SUSTAINMENT PER HOUR CH-53K																							
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
4	4	4	4	4	4	4	20	20	20	16	16	16	16	16	16	16	0	0	0	0	0	0	0

Best case for ship-to-objective sustainment

Worst case for ship-to-objective sustainment

Assault Support Lift Coverage- Option 2

Mission Area Analysis Branch—Analyzing the Future



Assault Support Lift Coverage- Option 2

Best and Worst Case

Mission Area Analysis Branch—Analyzing the Future

Start re-supply
Best Case

Start re-supply
Worst Case

							NIGHT																
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200

MPF(F) LHD - 12 x MV-22 + 12 x CH-53K

1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600
SPOT	FLIGHT WINDOW 2000 – 0600										RESPOT

MPF(F) LHA(R) –1 - 18 x MV-22 + 4 x CH-53K

1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
FLIGHT WINDOW										RESPOT

MPF(F) LHA(R) –2 - 18 x MV-22 + 4 x CH-53K

0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
SPOT	FLIGHT WINDOW									

AIRCRAFT AVAILABLE FOR SUSTAINMENT PER HOUR MV-22																							
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
18	18	18	18	18	18	18	30	30	30	12	12	12	12	30	30	30	18	18	18	18	18	18	18
AIRCRAFT AVAILABLE FOR SUSTAINMENT PER HOUR CH-53K																							
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200
4	4	4	4	4	4	4	16	16	16	12	12	12	12	16	16	16	4	4	4	4	4	4	4

Best case for ship-to-objective sustainment

Worst case for ship-to-objective sustainment

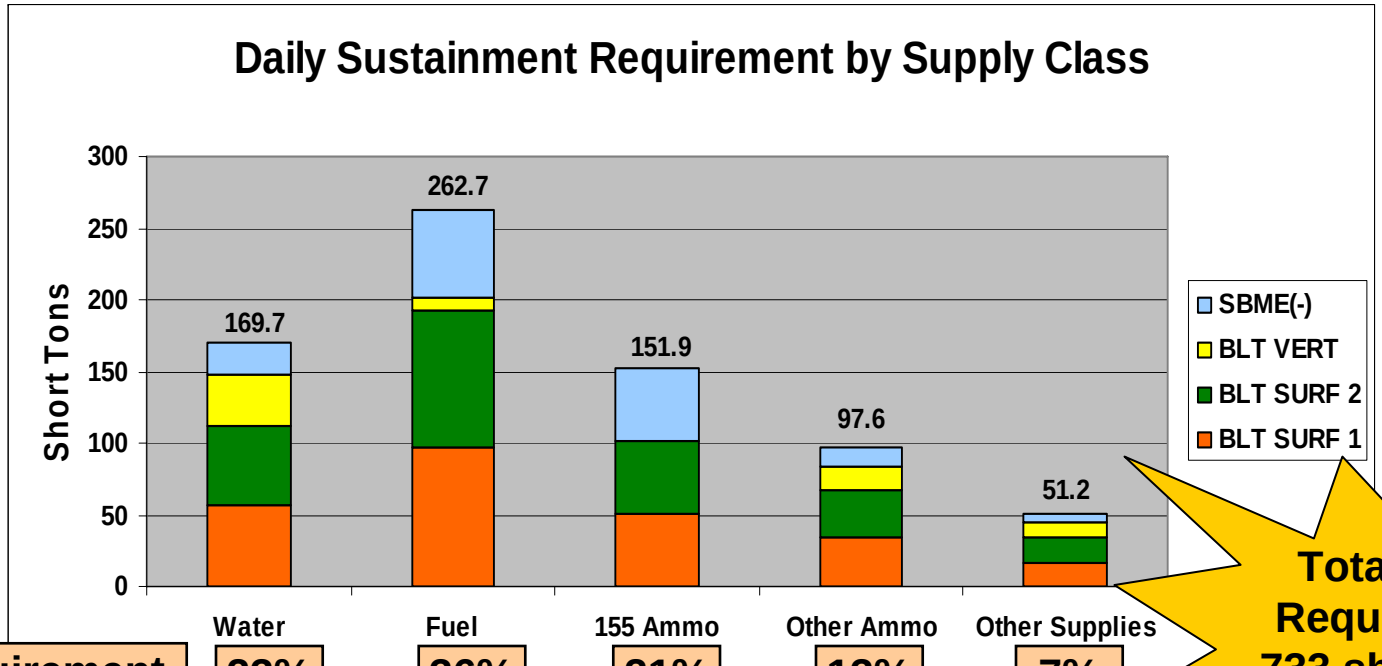
Ship-to-Objective Sustainment Updates

Sustainment calculations were modified during the course of this analysis due to:

- **New, emerging containers**
  - **JMIC (Joint Modular Intermodal Container) for dry goods and ammo replaces cargo nets**
  - **GERS (Ground Expedient Refueling System) for fuel replaces other refueling systems**
- **New planning factors for ammunition consumption**
  - **Replacement of MCO-8010.E (1997) with Draft MCO-8010 w/ POM-08 Combat Planning Factors (2006)***
  - **Includes composite threat**
    - **Infantry/armor heavy threats no longer used**

Impact of New Planning Factors for Ammunition

Mission Area Analysis Branch—Analyzing the Future



% of requirement by weight:	23%	36%	21%	13%	7%
Impact of new planning factors (in short tons)			+ 108.4	+ 36.3	

Total Daily Requirement 733 short tons

Due to changes in ammo requirements, the daily sustainment requirement of the SBME has increased from 583 to 733 short tons - a 26% increase

Daily sustainment requirements assuming composite threat and assault rate of consumption

Impact of New, Emerging Containers

Concept: Vertical resupply via external lift. Loads configured for MV-22, with CH-53Ks lifting three loads.

MV-22 Equivalent loads are defined as …

155 Ammo

- 4 x JMIC (8,375 lbs)
- cube out before max weight
- Use of JMIC: decrease of 800 lbs of ammo per load compared to cargo nets

Other Ammo

- 4 x JMIC (8,447 lbs)
- cube out before max weight
- Use of JMIC: decrease of 2,126 lbs of ammo per load compared to cargo nets

Other Supplies

- 8 x JMIC (6,519 lbs)
- cube out before max weight
- Use of JMIC: decrease of 1,825 lbs of supplies per load compared to cargo nets

Fuel

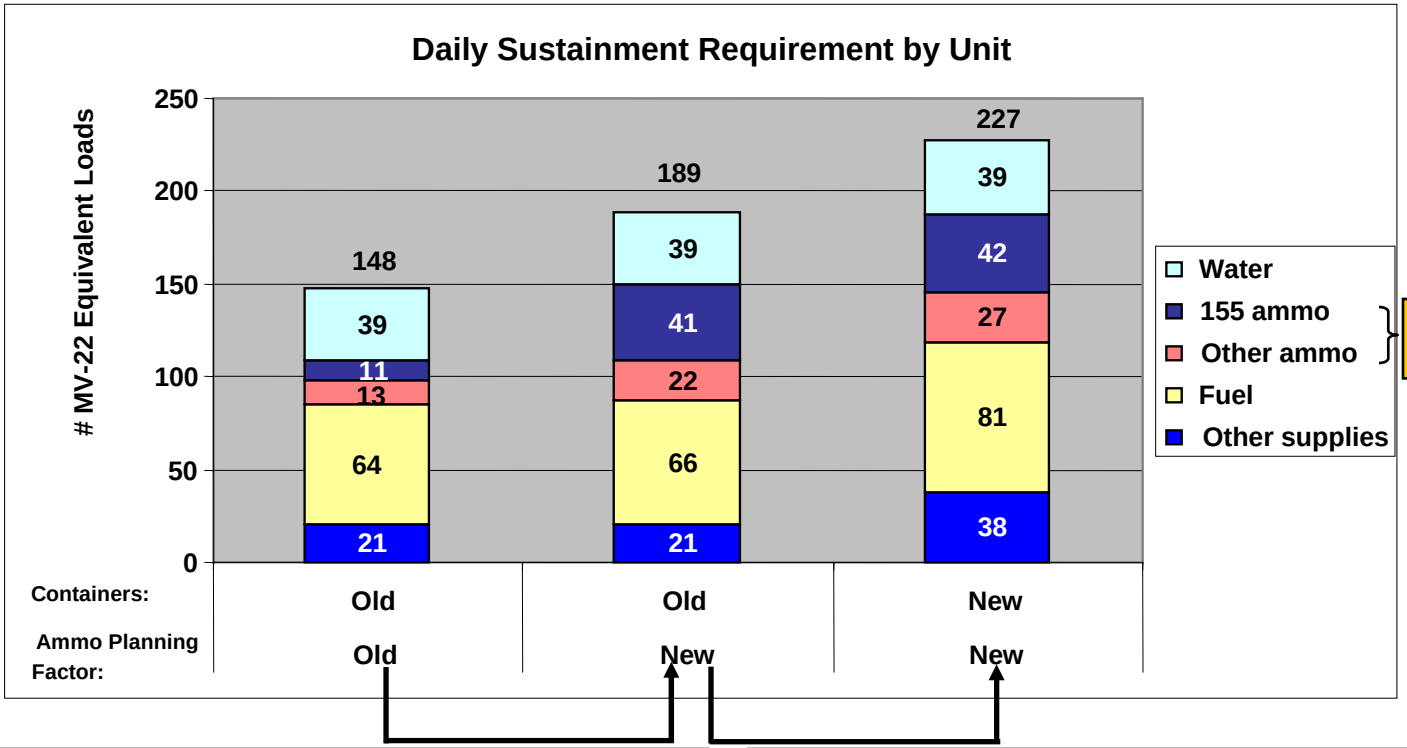
- 1 x 10K Cargo Net with 6 155 gal GERS (7,585 lbs) at LZs w/ trucks
- Use of 155 gal GERS: decrease of 1,836 lbs of fuel per load compared to 300 gal EFS
- 2 x 10K Cargo Net with 36 28 gal GERS (9,201 lbs) at LZs w/o trucks
- Use of 28 gal GERS: no change

Water

- 2 x 500 gal drum (8,967 lbs)

Impact of New Ammo Planning Factors and Packaging

Mission Area Analysis Branch—Analyzing the Future



187% increase in # ammo loads

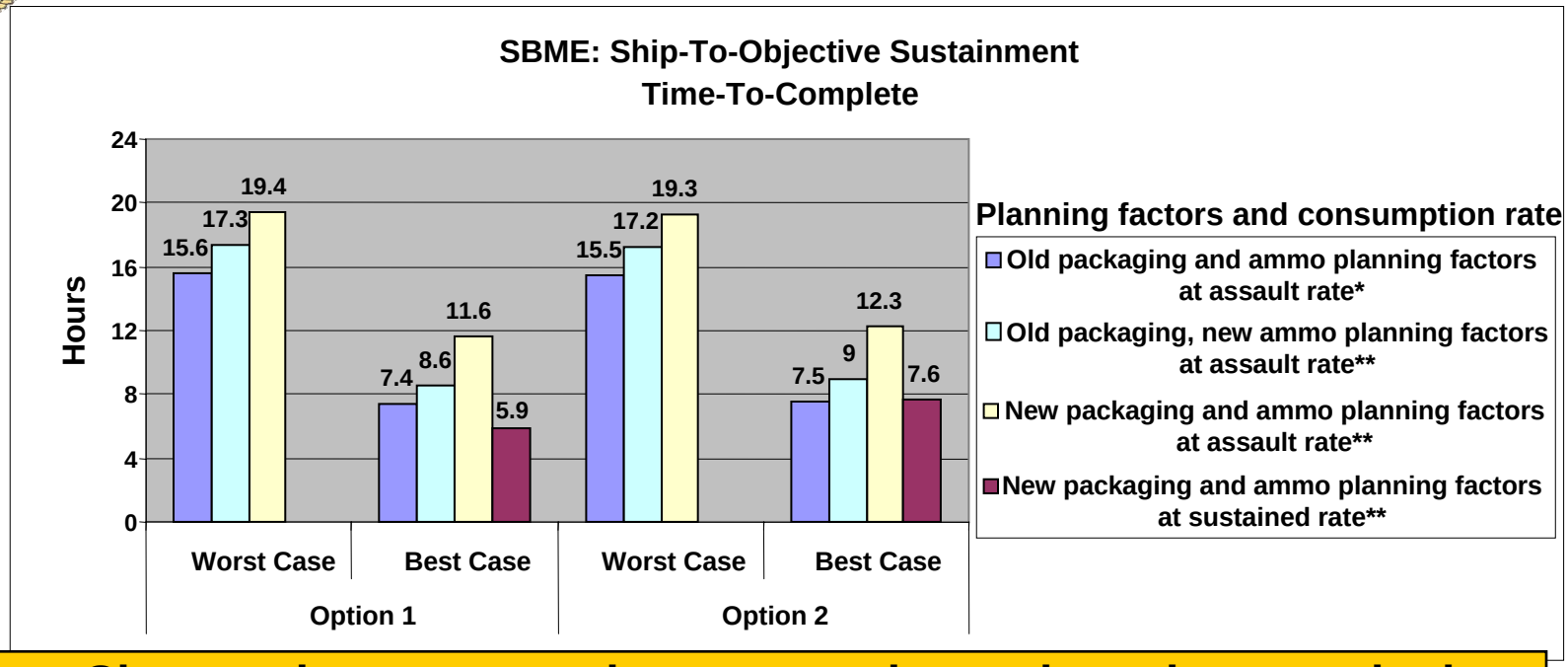
The change in ammo requirements account for 39 of 41 additional MV-22 equivalent loads (2 for adjusted fuel calculations)

The use of new and emerging containers account for 38 additional MV-22 equivalent loads

Changes in ammo requirements and containers have increased the number of MV-22 sustainment loads for the SBME by 53%

Ship-To-Objective Sustainment Results

Mission Area Analysis Branch—Analyzing the Future



Changes in ammo requirements and containers have pushed assault-rate sustainment of the SBME beyond a period of darkness

SBME can be re-supplied at sustained rate in a period of darkness

Source of sustainment:

2 LMSR – Water;

1-2 MPF(F) LHA(R)/MPF(F) LHD – Fuel;

2 T-AKE – Dry goods

14 Jun 07

*** Old ammo planning factors: MCO-8010.E (1997): 583 total short tons of sustainment (assault rate/ infantry-heavy)**

**** New ammo planning factors: Draft MCO-8010 (2006):**

733 total short tons of sustainment (assault rate/ composite);

470 total short tons of sustainment (sustained rate/composite)

Ship-to-Objective Sustainment "Take Aways"

- **Vertical ship-to-objective sustainment**
  - **Impact of changes in MCO-8010 and packaging containers:**
    - **53% increase in number of MV-22 equivalent loads required to sustain SBME**
    - **Time to sustain the entire SBME at assault rate extends beyond a period of darkness**
    - **SBME can be re-supplied at sustained rate in a period of darkness**
  - **Schedule mission during period that maximizes assault support capabilities**
    - **CH-53K is critical for delivery of sustainment ashore**

Agenda

- **Overall Assumptions**
- **Surface Assault**
- **Vertical Assault**
- **Ship-to-Objective Sustainment**
- ✓ **The "Take Aways"**

The "Take Aways"

- **Surface Assault w/ LCAC SLEP**
  - **<u>Can</u> meet 8-hour objective for landing surface BLT (w/out DS CSS and LAAD) with**
    - **Improved Surface Interface Point (SIP) processing time**

      -AND-
    - **Use of LCACs from MPF(F) LHD**
  - **<u>Cannot</u> meet 10-hour threshold for landing surface BLT, DS CSS, and LAAD**
- **Surface Assault w/ Notional LCAC(X)**
  - **<u>Can</u> meet 10-hour threshold for landing surface BLT, DS CSS, and LAAD with**
    - **Improved SIP processing time**

The "Take Aways" (cont'd)

- **Vertical Assault**
  - **<u>Can</u> meet 8-hour objective for landing vertical BLT (w/out DS CSS and LAAD)**
    - **With Marine Armor Kit (MAK) armored HMMWV at 35º C**
  - **<u>Can</u> meet 8-hour objective for landing vertical BLT, DS CSS and LAAD**
    - **Without MAK armored HMMWV at 15º C**
  - **<u>Can</u> meet 10-hour threshold for landing vertical BLT, DS CSS and LAAD**
    - **With MAK armored HMMWV at 35º C**

The "Take Aways" (cont'd)

- **Vertical ship-to-objective sustainment**
  - **Impact of changes in MCO-8010 and packaging containers:**
    - **53% increase in number of MV-22 equivalent loads required to sustain SBME**
    - **Time to sustain the entire SBME at assault rate extends beyond a period of darkness**
    - **SBME can be re-supplied at sustained rate in a period of darkness**
  - **Schedule mission during period that maximizes assault support capabilities**
    - **CH-53K is critical for delivery of sustainment ashore**

Questions?